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THE MYLAGAULIDÆ:

AN EXTINCT FAMILY OF SCIUROMORPH RODENTS

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THE MYLAGAULIDÆ; AN EXTINCT FAMILY OF SCIUROMORPH RODENTS.

The genus *Mylagaulus**, Cope, was originally based upon a single lower premolar tooth, but later it was supported by the description of a fairly complete mandible.† From this material two species were determined, *M. Monodon* and *M. sesquipedalis*. Later the family name, *Mylagaulidæ*, was proposed for these forms. To this group it is now proposed to add the two genera described below.

Lateral view of mandible of *Mesogaulus ballensis* × ⅔.

Dentition of same as seen from above × ⅔.

Mesogaulus ballensis, *gen. et sp. nov.*

A rodent mandible from the Deep River escarpments near White Sulphur Springs, Montana, and now in the Museum collection, shows interesting characters hitherto undescribed. As suggested by Professor Scott, its nearest affinities are with *Mylagaulus*, Cope, though it is a more primitive form and evidently stands in an ancestral relation to that group. The name *Mesogaulus ballensis* is proposed for it in honor of Mr. S. H. Ball, the collector. The characters distinguishing this genus from *Mylagaulus* are: First molar elongate antero-posteriorly with enamel slightly inflected externally; the third molar rather stronger than the second and rotund in outline. The type specimen was found in the alluvium at the base of an escarpment, so that its horizon cannot be exactly determined. However, it certainly belongs to the upper beds.‡

*Bulletin of the U. S. Geological and Geographical Survey, vol. iv., No. 2, May, 1878.
†American Naturalist, Jan. 1883.
‡The Mammalia of the Deep River Beds, Am. Phil. Soc., Oct. 1893.

The specimen consists of a single mandible from which the angle, condyle, part of the coronoid process and the tip of the incisor have been lost. The remainder is in good preservation and shows a perfect molar dentition. The teeth are deeply set in the alveolus and their well-worn crowns indicate an animal fully adult. The molars are ranged in a line parallel to the plane of the symphysis, but the axes of the teeth themselves are inclined well inward at the crowns. As in *Mylagaulus*, the angle of the mandible is within the plane of the incisive alveolus, but the condyle would fall somewhat without it. The coronoid process is strong at the base and is directed outward, leaving a broad fossa between its mesial surface and the posterior molars. At the hinder margin of this fossa the dental foramen opens. Almost continuous with the anterior margin of the coronoid process, arising just below the posterior third of the premolar alveolus and extending downward toward the angle, is a strong masseteric ridge. The symphysis extends far back beneath the premolar alveolus where its termination forms a prominent angle in the inferior outline of the mandible. The ramus is concave on the mesial surface throughout, and posteriorly bears evidence of a deep fossa. The incisor is covered anteriorly with a thin orange-colored enamel. At the alveolus, where it is broken, the section is roughly sub-triangular. The anterior surface meets the median one in a sharp angle; with the lateral surface it forms a rounded one; while posteriorly the faces converge to form a single rounded surface. The premolar, as before mentioned, has its crown much elongated antero-posteriorly and the enamel slightly inflected on the lateral margin. A series of three enamel fossettes are arranged in the median line of the crown, with a trace of a fourth lying lateral to them. The anterior surface is comparatively narrow, the crown reaching its greatest width opposite the third fossette, while opposite the middle one occurs the external enamel inflection. The second molar is a small tooth, compressed antero-posteriorly, and like the third, entirely devoid of fossæ or enamel inflections. In both, the enamel is absent from the mesial surface and in the first it is noticeably thinner. All are encased in thick sheaths of cement. The last molar is grooved on the mesial surface throughout its length, indicating the not very remote coalescing of roots. The other molars I have not examined below the alveolus. A possible trace of a fourth alveolus remains, but the space between the third molar and the dental foramen is so reduced that a fourth tooth could not have developed in this individual.

MEASUREMENTS.	M.
Length from posterior incisive alveolus to posterior molar surface	.023
Length of inferior molar series	.013
Length of diastema	.010
Antero-posterior diameter of premolar	.009
Greatest lateral breadth of premolar	.0042
Greatest lateral breadth of last molar	.0035
Depth of mandible at anterior molar alveolus	.017

Protogaulus hippodus gen. nov. (sp. Cope.)

In view of the later described relationship of *Meniscomys hippodus** to the *mylagaulid* phylum, as well as its differences from other members of the genus, it seems desirable for the sake of natural grouping to transfer the species to the *Mylagaulidæ*. Upon these grounds it is proposed to create for it a new genus, retaining the specific name. The generic characters thus distinguishing *Protogaulus* from *Meniscomys* are: "Superior molars short-rooted with external face plane; inferior molar with a prominent median transverse crest;"† premolar much larger than molars and having the crescents separated by a deep external fissure; inferior incisor with a wide groove on its external face.

MEASUREMENTS.†	M.
Length of superior molar series	.008
Length from base of first superior molar to base of incisor	.0065
Width between bases of first molars	.002
Length of first inferior molar	.0033
Depth of ramus at second molar	.0050

RELATIONSHIP: The relations of *Mylagaulus* were for some time left in doubt, but eventually Professor Cope proposed for these forms the family *Mylagaulidæ*. As pointed out by him, the marked development of the lower premolar and the characters of its crown present striking similarities to the dentition of certain species of *Hystrix*, especially *H. refossa*. But the complete absence of roots, even in the more primitive form, *Mesogaulus*, together with the dissimilar origin of the angular portion of the mandible, render the suggested relationship improbable. All of these characters are essentially *sciuromorph* and to that group the *Mylagaulidæ* certainly belong.

The presence of but three molar teeth and the complete isolation of the enamel fossettes were offered as grounds for the erection of the family *Mylagaulidæ*. If these characters were pos-

*Proceedings American Philosophical Society, 1878 (-79), p. 67.
†Cope's Tertiary Vertebrata, p. 829.

sessed by no other forms they might be regarded as of more than generic importance, but in point of fact, the dental formula is the same as that of *Eucastor* Leidy* and the later described *Sigmogomphius* Merriam,† both of which have true *castoroid* affinities. As to the second feature, the isolated enamel lacunæ are independently developed in several forms and are doubtless dependent upon the amount of wear to which the tooth is subjected. Therefore this group has not been generally recognized by later writers, and the genus has been provisionally included under the *Castoridæ*.

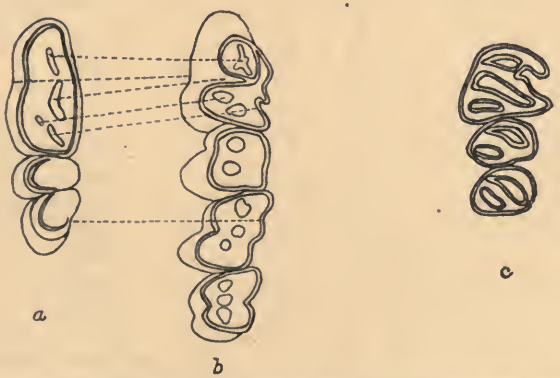
Nevertheless the *Mylagaulidæ* appear to be a unique, and, until now, isolated, form. The one prominent feature is the unusual development of the premolar to the exclusion of the posterior-lying teeth. Associated with this is the great strength and shortness of the mandible, the prominence and anterior position of the masseteric ridge and the depth of the ramus from alveolus to angle. These tell an unmistakable story: Unusual capacity for crushing or grinding and the attendant specialization of the premolar to perform the function laid upon it. Just as in the *Carnivora*, the lower first molar, lying immediately anterior to the insertion of the masseter muscles, has developed into the principal shearing tooth; so in these forms, the last premolar, standing in the same relation, has fitted itself for a crushing implement which, in *M. Monodon*, has reached the highest degree of specialization known to *Rodentia*. It would be most interesting to know the food habits of these unique animals. Such a *machoire* might well have fitted them for nut-cracking or the crushing of hard-shelled seeds; but the abraded crowns of all the molars, together with their hyposodont character of growth, makes it probable that the great tooth with its enamel pits was used largely as a grinding surface.

PHYLOGENY OF THE MYLAGAULIDÆ.

Upon the problem of phylogeny the limited material thus far known throws comparative little light. An ancestor of *Mesogaulus* would be expected to have a less strongly developed premolar with at least one lateral enamel inflection, to show traces of a third lower molar, and perhaps retain further evidences of molar roots. These conditions are largely fulfilled in the proposed genus *Protogaulus hippodus*. In this form the mandible has the

*American Naturalist, July, 1881, p. 586.
†Bulletin of the Department of Geology, Univ. of California, vol. I, No. 13.

premolar considerably enlarged, though the crown is little elongate antero-posteriorly. The third molar is retained, but is somewhat smaller than the second, and short roots are present throughout. Cope describes the mandibular dentition as follows:* "The crowns of the inferior molars, in the unworn condition, terminate in two crescents; that is, in elevated, anterior, external and posterior borders, with a transverse ridge equally dividing the space thus marked out and joining the notch in the external crest. This pattern resembles somewhat that of *Anchitherium*. The first inferior molar (premolar) differs from the others in its superior size and its having the crescents more widely separated by a deeper external emargination. On attrition the spaces bounded by the enamel crests are enclosed by the junction of the extremities of these crests on the inner side of the crown. Further attrition results in three lakes within the crown and one notch of the external border and two notches of the internal border. The anterior molar has two lakes in its posterior area and one large one in its anterior area. In old teeth there are successively one and no lakes left to interrupt the dentine. The inferior incisor has a wide shallow groove or concavity on its external face."



(*a*) Lower dentition of *Mesogaulus* × 2. (*b*) The same of *Protogaulus* (*Meniscomys*, Cope) × 4. (*c*) Upper dentition of *Hystrix refassa* × 2.

From this the affinities with *Mesogaulus* at once appear. In that genus the lateral emargination of the premolar has almost disappeared, and the cleft is represented by the deeper middle fossette. The large anterior lake described in *Protogaulus* is replaced by a smaller one in the later form; the deep postero-in-

*Cope's Tertiary Vertebra, p. 828.

ternal cleft is traceable in the elongate third fossa, which is barely separated from the enamel border. A mere trace of a fourth fossette lying lateral to, and between the second and third, doubtless represents the posterior one in the ancestral form. The true molars have lost their important characteristics in the process of reduction, but even in the earlier form the first molar shows the antero-posterior compression so noticeable in *Mesogaulus*, while in that form the second molar retains something of the diagonal elongation seen in the other, and also a trace of its median internal flexure.

The following table will be of service in showing the distribution, both in time and locality, of the extinct *sciuromorph* rodents. It is based upon Zittel's classification, except in instances where later discoveries have thrown additional light upon the subject:

DISTRIBUTION OF SCIUROMORPH RODENTS IN NORTH AMERICA.

	Oligocene.	Miocene.			Pliocene.	Pleistocene.
	White River.	John Day.	Deep River.	Nebraska Beds.	Diluvium.	Cave Deposits.
Geomyidæ:						
Gymnoptychus montanus	×					
" *trilophus*	×					
Heliscomys vetus.	×					
Pleurolicus leptophrys		×				
Entoptychus crassiramis				×		
" *planifrous*				×		
Castoridæ:						
Steneofiber nebrascensis	×					
" *peninsulatus*	×					
" *pansus*	×					
" *gradatus*		×				
" *montanus*			×			
Eucastor tortus				×		
Castor fiber					×	×
" *pelicedens*						×
" *rosinæ*						×
Sciuridæ:						
Arctomys vetus				×		
" *monax*						×
" *fossilis*						×
Sciurus relictis	×					
" *vortmani*		×				
" *calycinus*						×
" *panolius*						×
Tamius lavideus						×
Meniscomys liolophus		×				
" *cavatus*		×				
" *niteus*		×				
Mylagaulidæ:						
Protogaulus hippodus		×				
Mesogaulus ballensis			×			
Mylagaulus sesquipedalis				×		
" *monodon*				×		

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